Exploring Impact: Negative Effects of Social Networks

Henrik Egbert[1], Teodor Sedlarski[2]
1 Department of Economics, Anhalt University of Applied Sciences,Bernburg, Germany
Email: h.egbert@wi.hs-anhalt.de
[2]Department of Economics and Business Administration,
Sofia University St. Kliment Ohridski, Sofia, Bulgaria
Email:sedlarski@feb.uni-sofia.bg

Abstract **- The sociological literature on social networks emphasizes by and large positive network effects. Negative effects of such networks are discussed rather rarely. This paper tackles negative effects by applying economic theory, particularly neoclassical theory, new institutional theory and the results from experimental economics to the concept of social networks. In the paper it is assumed that social networks are exclusive and since exclusiveness affects the allocation of resources, negative external effects may occur. The argument of the paper is that it is not only advantages for network members that need to be investigated but also the disadvantages for non-network members. The results have two implications. The first one is for economic policy, which often fosters social networking while ignoring their negative externalities. The second one is for network research that can benefit from a more rigorous application of economic theories.**

Keywords **-** *social networks, network effect, network externality, transaction costs, negative effects*

1. Introduction

Social networks have become a core topic among others in social sciences in the last decades. Social network theory was one of the sociologists' answers to new institutionalism which emerged in economics some decades ago. Granovetter's seminal work on embeddedness of social action [1] attacks economists' views on markets and on hierarchies [2][3][4][5] alike [6][7]. The concepts of social embeddedness of individual action and of social networks have been the battle horse for New Economic Sociology since the mid-1980s [8]. Apart from science, these concepts have also gained considerable support on the political arena. Political organizations such as the EU provide incentives—mainly in the form of monetary subsidizing—fostering networking of individuals, e.g. entrepreneurs or researchers. Some politicians apparently expect that positive effects of social networks emerge also for groups other than network members. For instance, social networks may speed up the production and flow of knowledge and other goods in a society. Negative effects of social networks are largely ignored both in the sociological literature and by political actors. Yet, negative effects may emerge not only for network members, but also for non-network members and for societies at large. In this paper the focus is on such negative effects of social networks. The aim of the paper is to address this deficit and to add critical thoughts to the ongoing discussion on social networks, which we consider biased and in favour of positive network effects.

A social network (SN) is formed by individuals connected by links. A SN can have a horizontal or vertical structure[1], for instance between buyers and sellers in a market. A SN is not complete so that not all individuals in a society are members. Thus a SN is exclusive by definition. Examples are networks of entrepreneurs who share factor inputs ([9] for industrial districts), networks of scientists who exchange knowledge [10][11], networks of workers who set up a trade union, networks of consumers or sellers (e.g., [12][13][14]). A common feature of SN is that they influence markets: the market for consumer goods is influenced by entrepreneurs' decisions to collude, the market for scientific goods is influenced by scientific networks, trade unions influence the labour market and organized consumer groups influence prices and quality of products. The decision to form and to contribute to a SN does not merely affect the well-being of those individuals who are in the network but also the well-being of non-network members. Effects on third parties can be positive or negative.[2]

In economics, the terms 'network effect' and 'network externality' are often used interchangeably [15]. Liebowitz and Margolis [16] identify a network externality as a network effect that allows realizing additional gains through network participation (cf. also [15]). The presence of a network externality implies that decisions of certain individuals influence the well-being of others either directly or indirectly. Katz and Shapiro [17] coined the term network externality and referred to it mainly as positive consumption externalities (cf. additionally [18][19]).

[1] A SN may have the form of a star, a circle or a Y.
[2] Negative effects also occur for network members. The spread of a computer virus or of diseases is much faster if actors are linked than if they are not. Compare [23] who refers to the epidemiology literature and formalizes in a model the spread of infections in networks. See also [24] for a model on the spread of (mis)information in networks.

For instance, if many individuals decide to purchase the same telecommunication service, communication among these individuals is facilitated and a positive network effect occurs [20]. The term network externality hints at the existence of a market failure [21]. As in the communication example, network effects and externalities are discussed most often for the demand side of an economy but they are also prevalent for the supply side (cf. [15] for a recent review on empirical findings). In this paper the focus on SN is on the supply side. The consequence of negative effects is that (certain) non-members of SN experience losses, while those in the SN experience gains (cf. e.g., [22]).

The structure of this paper is as follows. In the second section traditional economic theory which does not deal with institutions is used. Although this theory suffers from a shortcoming when applied to real life situations, it serves well as a reference point of efficient allocations and also explains why individuals could have an incentive to set up a SN. In the third chapter SN are considered as institutions in the sense of New Institutional Economics. As institutions, SN compete with alternative institutions for the allocation and distribution of resources. Since all institutions are related to specific transaction costs, different costs emerge if different institutions are used as allocation mechanisms. For the analysis the focus is on the transaction cost theory. In the fourth section the empirical results of network theory as found in experimental economics are discussed. The fifth section concludes.

2. Neoclassical Economics

Traditional theory implies the assumption of perfect markets and rational individuals. These assumptions help to identify efficient allocation of resources. In a model with a demand and a supply function a market clearing price and the related quantity in equilibrium are determined. Any distortions from this equilibrium lead to inefficient situations. Under the assumption of a perfectly competitive market, however, distortions do not occur. The rational individual is an optimizing agent with perfect foresight, for simplicity we may think of an egoist who maximizes material utility and is perfectly informed. As a starting point, this model can help us to illustrate negative effects of networks.

However, few economists restrict their thoughts to the perfectly competitive model. Instead, it is reasonable to assume that market distortions are possible. For example, we may think of an oligopoly which constitutes a collusion of suppliers. Then market outcomes are inefficient as compared to the outcome in a model of perfect competition. Information asymmetries and information costs [25][26][27] are another reason for the emergence of inefficiencies and can account for a market failure. If it is assumed that asymmetries occur, then they will have an effect on rational individuals' optimizing behavior. Furthermore, rational individuals have an interest in creating and maintaining information asymmetries because these asymmetries facilitate higher gains (e.g., quasi-rents) than on a perfectly competitive market (cf. [28]). SN are related to information asymmetries. Since SN are exclusive, members of SN have different information from that of non-members. Rational individuals have an interest to replace or supplement the market as an allocation system through a SN because members are thus able to obtain individual gains. One of the consequences is that inefficiency occurs. If a SN is in place, non-members are worse off and the situation is Pareto inferior to the market situation. For instance, if a trade union organizes its members successfully, this SN may induce a wage rate above a market clearing wage with a possible consequence of an increasing unemployment rate in the industry. The situation with the SN in place may also be inferior according to the Kaldor-Hicks criterion, i.e. if the aggregated wage gains of union members are insufficient to compensate the aggregate wage losses of those becoming unemployed. In this case a negative effect occurs for the society at large.

Nonetheless, it is not ignored that in specific contexts setting up a SN may constitute a Pareto improvement. If a market does not exist and cannot be implemented (e.g., due to problems of adverse selection), then, despite the fact that demand and supply are positive, the equilibrium price and quantity in equilibrium are both zero. In this case the society is better off if exchange is initiated by a SN. This exchange is inefficient and discriminatory when compared with the equilibrium on a perfectly competitive market. It is, however, a Pareto improvement compared to a situation with zero exchange (cf. [29][30][31]).

To sum up this section, the argument is that the neo-classical model of perfect competition with its underlying assumptions cannot explain the existence of or the necessity for SN. Nevertheless, the concept of optimizing individuals is central for the explanation of SN. More minimalist assumptions such as information asymmetries make it possible to explain why SN come into existence and why SN can be stable. Firstly, they come into existence because they offer a way to diminish information asymmetries among members, e.g. reputation mechanisms [32]. Secondly, some individuals are better off if they are in the SN because they are able to extract quasi-rents when barriers to entry exist. A shift away from a SN—coming closer to the model of perfect competition—would induce losses for network members. Thus, once a SN is in place, it could be costly to implement a market (cf. [33]). Thirdly, the model of perfect competition provides us with a reference point of an ideal case. With this reference point inefficiencies induced by SN can be identified. In the next section SN are related to New Institutional Economics which operates with a different set of assumptions.

3. New Institutional Economics

New Institutional Economics takes into account the existence not only of information asymmetries, but also of bounded rationality, path dependence, and institutions, preserving the assumption of optimizing (or at least satisfying, cf. [34]) individuals. Institutions are norms and behavioral rules, decision making systems, organizations [35] or their combinations. In this sense a SN is an institution. Institutions can emerge spontaneously [36] or are created by individuals [37] who, for instance, set the rules of entry or rules for communication (e.g., as "market-makers" [38]). This applies also for a SN. For analytical purposes it is helpful to employ the concept of transaction costs3 from New Institutional Economics', i.e. the costs of implementing and running an institution [39][40].

In this paper a distinction is made between the comparison of individual institutions on the one side and different structures of the same institution, on the other. The analysis starts with the comparison between individual institutions that serve the same aim. Transaction costs of these institutions can be contrasted—all other factors kept equal. A case in point is institutions that facilitate exchange such as markets, networks, or hierarchies. If transaction costs of markets are comparatively high but if a switch to an alternative institution with lower transaction cost is possible, then the situation is Pareto inefficient. Coase [41] explains the existence of the firm (as an institution) through lower transaction costs: specific processes bear lower transaction costs if a firm is used instead of market exchange. Another example is the institution of law. If law enforcement is not feasible due to high transaction costs, an alternative institution such as a SN can facilitate contract enforcement in specific environments at comparatively lower costs [42]. Closely related are problems of asymmetric information on markets, which may lead to adverse selection or moral hazard. The risks of falling victim to problems of information asymmetries can be reduced by SN [43][44]. These examples indicate that different institutions lead to a different size (but also a different kind) of transaction costs.

In the SN transaction costs of exchange are often reduced by eliminating anonymity. Instead of anonymous relations, relational contracts among network members emerge. Relational contracts regulate repeated interaction and individuals are not anymore anonymous (as in traditional theory) but have an identity (cf. [45][46]). Reputation is created through repeated interaction of SN members. Shared network identity makes the occurrence of a contract violation less probable to occur because a violator's actions can be retaliated [42][1][47]. Consequently, a SN reduces insecurity over decisions of others because a SN limits the set of behavioral choices. In this sense setting up and participation in a SN is an optimizing behavior under the assumption of bounded rationality (cf. [48]).

Next, negative effects are examined. A differentiation between effects for non-members and for members of SN is made. Since SN are exclusive, non-members cannot influence processes within the network but are affected by the decisions of network members. A case in point is a reallocation of given resources in such a way that network members receive more and non-members less of these resources. Political processes in which successful lobbying or rent-seeking of a SN leads to a reallocation of resources is an example at hand (cf. additionally [50]). Cartels and collusions on product markets provide further examples (cf. additionally [51]). Consequences of a reallocation can be an increase in inequality (e.g., in income or educational opportunities). Another effect can be that SNs are a cause for unexploited gains from trade (cf. [47]) because the number of trade partners is limited to SN members with the consequence that a deadweight loss occurs[4].

Apart from that, members can also be exposed to negative effects. Business networks that are based on common religious background of its members [52] are an illustration. While the SN itself is beneficial for some members it is not necessarily beneficial for all members. Particularly if an exit barrier does not allow members to leave a SN, those members who would be better-off without the SN have to stay as members. For instance, business environments exist where a business loan can only be received by network members. Such a situation may be beneficial for some but not for all individuals in the SN (see [53]). In such cases a limitation of the exchange partners to SN members causes a negative effect. Another case of networks with negative effects on members is the creation of knowledge in science discussed by Jackson and Wolinsky [54]. The authors provide a model in which a researcher is working on projects with different co-authors. Links connect the researcher and her co-authors. If the researcher decides to build up additional links with new co-authors, her decision has a negative effect on the productivity of her already existing network. The model leads to the result that all previous co-authors are worse-off if the researcher decides to extend her network. The model hints at a set of specific problems: optimal network size and optimal network form.

Finally, the question about the negative effects of SN in the long run is posed. From a game theoretic perspective an institution constitutes a Nash equilibrium [55], so does a SN. Since Nash equilibria can be inefficient, a SN can constitute such an inefficient equilibrium. Such an inefficient

[3] For the implementation of the concept see [41] and [49].

[4] For an evaluation of the net effects of SN the Kaldor-Hicks criterion could be applied.

equilibrium can be observed if some members of the SN are worse-off compared to a situation without the SN, yet these members cannot exit the SN. In this case the SN is harmful because negative effects are not temporary but persistent over time. The concept of path dependence can explain the emergence of permanently inefficient SNs (cf. additionally [33]). Even when individuals are aware of negative SN effects, they cannot individually develop the institution to the better and collective action may be too costly to organize [50]. Consequently, inefficiency perpetuates.

Since SN are causes for positive and negative effects on its members and on non-members, the question of net effects of SN is important. One option for measuring these effects is provided through economic experiments. In the next section the potential of the experimental approach is outlined.

4. Experimental Economics

The literature provides a large number of case studies of SN, e.g. in the journal of Social Networks and in journals related to industrial organization. A recent economic survey of empirical studies on networks is provided by [15]. This section briefly refers to such empirical studies conducted by using economic experiments[5]. Economic experiments permit collecting data in a controlled environment and the method is incentive-compatible, i.e. provides incentives for participants to exhibit their preferences. Another advantage of economic experiments is that they enable us to derive generalizations which go beyond specific case studies.

Kosfeld [56] provides a survey of economic experiments related to networks. He distinguishes between four types of experiments on networks: coordination networks, cooperation networks, buyer-seller networks, and network formation. None of the mentioned experiments in Kosfeld's survey explicitly investigates negative network effects. The empirical findings of the summarized experiments are partly in line with the predictions derived from economic theories, the results are partly inconclusive. In the next paragraph Kosfeld's results are summed up.

First, experiments on networks in coordination games find out—by and large—that players converge to an efficient Nash equilibrium. Second, the results from experiments on cooperation in networks are inconclusive and are not always in line with theoretical predictions. Kosfeld's explanation of the results in these experiments is that learning from other players does not occur. Third, buyer-seller network experiments mainly center on specific simulated markets. Cassar et al. [61] have recently addressed the problem of non-enforceable contracts in trade. In their experiments they find out that the implementation of networks leads to increased efficiency. This finding supports the previously mentioned institutional theory that networks as institutions can lead to higher efficiency if market imperfections exist. Fourth, most network formation experiments are directly or indirectly related either to the theoretical work of Jackson and Wolinsky [54] who introduced the concept of pairwise stability of links in networks, i.e. a bilateral agreement to establish a link between actors is necessary, or Bala and Goyal [62] who use unilateral link formation. Receiving non-rival information is the main advantage for individuals to connect with other individuals in these network models. Furthermore, the models consider the costs of being connected. The models tackle the questions of optimal network form and network size. Experimental studies investigate whether the predicted Nash equilibria with respect to network form and size are played. The experimental results demonstrate that several aspects seem to have an influence on what is actually played. Risk and fairness perception are among these aspects. Mantovani et al. [63] have recently shown that agents in a network experiment behave 'farsighted' (regarding future) with respect to the stability of a network.

To sum up, at present the experimental studies on networks focus primarily on whether or not a theoretically predicted Nash equilibrium is played and on the factors that lead to the emergence of a Nash equilibrium. None of the experiments focuses explicitly on network externalities, such as negative effects.

5. Conclusions

Furubotn and Richter [64] state that a thorough analysis of collective action in cases of organized group interests is still missing in economic research (but see [65]). Collective action is one of the strains of economic research that provides the appropriate analytical tools for revealing negative network effects. The very existence of SN is closely related to the aim of extracting rents [66][50]. According to Olson's [67][50] theory, the smaller the size of a group is, the more effective the organization of collective action among its members is, and hence the achievement of its goals. Thus exclusion from resources through non-membership in organized groups is a main feature of SN. Surprisingly, promoting SN has been adopted by international and national organizations as a standard policy tool. For instance, the European Union or national governments promote the emergence of scientific networks, of business clusters and other SN. The aim of such policies is to generate positive effects for members and non-members of the SN alike. However, negative effects caused by these SN are largely ignored (cf. [68] for SN in science). Taking these negative effects into consideration, a SN is not a cure for a problem but rather the cause of a disease.

[5] Economic experiments have become a standard methodology in investigating decisions. For overviews on the method and on the main researched topics compare [57][58][59][60].

Indeed it prevents a society from finding more efficient institutional arrangements to solve social issues. Once a SN is installed, it is difficult to replace it even if it is inefficient and even if its inefficiency is observable and known. Self-enforcing mechanisms of SN can lead to an increase of transaction costs and are able to hamper economic growth and social change, a process which Olson illustrated in a historical example as 'institutional sclerosis'. The conclusion is that the rather one-sided view—as often employed in social sciences and in policy—that SN exercise positive effects, is to be replaced by a more rigorous analysis which incorporates negative effects as well.

References

[1] Granovetter, M., "Economic Action and Social Structure: the Problem of Embeddedness", *American Journal of Sociology* 91(3), pp.481–510, 1985.

[2] Williamson, O. E., *Markets and Hierarchies: Analysis and Antitrust Implications*, New York: Free Press, 1975.

[3] Williamson, O. E. *The Economic Institutions of Capitalism: Firms, Markets, Relational Contracting*, New York: Free Press, 1985.

[4] Williamson, O. E., "Hierarchies, Markets and Power in the Economy: An Economic perspective", *Industrial and Corporate Change* 4(1), pp.21–49, 1995.

[5] Williamson, O. E., "The New Institutional Economics: Taking Stock, Looking Ahead", *Journal of Economic Literature*, 38(3), pp.595–613, 2000.

[6] Grabher, G., Rediscovering the Social in the Economics of Interfirm Relations, in G. Grabher (ed.) *The Embedded Firm: On the Socioeconomics of Industrial Networks*, London: Routledge, pp.1–31, 1993.

[7] Powell, W. W., "Neither Market nor Hierarchy: Network Forms of Organization". *Research in Organizational Behavior*, 12, pp.295–336, 1990.

[8] Richter, R., "New Economic Sociology and New Institutional Economics", Paper presented at the annual conference of the International Society for New Institutional Economics (ISNIE), Berkeley, California, September 2001.

[9] Humphrey, J., Introduction, *World Development*, 23(1), pp.1–7, 1995.

[10] Jansen, D., Research Networks–Origins and Consequences: First Evidence from a Study of Astrophysics, Nanotechnology and Micro-economics in Germany, in M. Albert, D. Schmidtchen, S. Voigt (eds.) *Scientific Competition: Conferences on New Political Economy*, Vol. 25, Tuebingen: Mohr Siebeck, pp.209–230, 2008.

[11] Powell W. W.; Smith-Doerr, L., Networks and Economic Life, pp.368–402, in N. J. Smelser; R. Swedberg (eds.) *The Handbook of Economic Sociology*, Princeton, NJ: Princeton University Press and Russell Sage Foundation, p.387, 1994.

[12] Kenney, R. W., Klein, B., "The Economics of Block Booking", *Journal of Law and Economics*, 26(3), pp.497–540, 1983.

[13] Klein, B.; Leffler, K. B., "The Role of Market Forces in Assuring Contractual Performance", *Journal of Political Economy*, 89(4), pp.615–641, 1981.

[14] Greif, A. *Institutions and Trade during the Late Medieval Commercial Revolution*, New York: Cambridge University Press, 2005.

[15] Birke, D., "The Economics of Networks: A Survey of the Empirical Literature", *Journal of Economic Surveys*, 23(4), pp.762–793 (p.765), 2009.

[16] Liebowitz, S. J.; Margolis, S. E., "Network Externality: An Uncommon Tragedy", *Journal of Economic Perspectives*, 8(2), pp.133–150 (p.135), 1994.

[17] Katz, M. L., Shapiro, C. "Network Externalities, Competition, and Compatibility", *American Economic Review*, 75(3), pp.424–440, 1985.

[18] Economides, N. "The Economics of Networks", *International Journal of Industrial Organization*, 14(6), pp.673–699, 1996.

[19] Farrel, J., Salomer, G. "Standardization, Compatibility, and Innovation", *Rand Journal of Economics*, 16(1), pp.70–83, 1985.

[20] Furubotn, E. G.; Richter, R., *Institutions and Economic Theory: The Contribution of the New Institutional Economics*, 2nd revised and extended edition, Ann Arbor, MI: University of Michigan Press, 2005 (p.323).

[21] Liebowitz and Margolis 1994, pp. 134-135.

[22] Kali, R. "Endogenous Business Networks", *Journal of Law, Economics, and Organization*, 15(3), pp.615–636, 1999.

[23] Jackson, M. O., The Economics of Social Networks, in R. Blundell, W. K. Newey, T. Persson (eds.) *Advances in Economics and Econometrics* Vol.1, Cambridge: Cambridge University Press, 1–56, 2006 (pp. 39-42).

[24] Acemoglu, D.; Ozdaglar, A.; ParandehGheibi, A., "Spread of (Mis)information in Social Networks", *Games and Economic Behavior*, 70(2), pp.194–227, 2010.

[25] Stigler, G. J., "The Economics of Information", *Journal of Political Economy*, 69(3), pp.213–225, 1961.

[26] Stiglitz, J. E., "Information and Economic Analysis: A Perspective", *Economic Journal*, 95(supplement):21–41, 1985.

[27] Stiglitz, J. E., "Information and the Change in the Paradigm in Economics", *American Economic Review*, 92(3), pp.460–501, 2002.

[28] Akerlof, G. A., "The Market for 'Lemons': Quality Uncertainty and the Market Mechanism", *Quarterly Journal of Economics* 84(3), pp.488–500, 1970.

[29] Fafchamps, M.; Minten, B., "Returns to Social Network Capital among Traders", *Oxford Economic Papers*, 54(2), pp.173–206, 2002.

[30] Furubotn and Richter 2005, p.337.

[31] Greif, A., "Reputation and Coalitions in Medieval Trade: Evidence on the Maghribi Traders", *Journal of Economic History* 49(4), pp.857–882, 1989.

[32] Greif 1989, p.881.

[33] Kranton, R. E., "Reciprocal Exchange: A Self-sustaining System", *American Economic Review*, 86(4), pp.830–851, 1996.

[34] Simon, H. A., "Rational Choice and the Structure of the Environment", *Psychological Review*, 63(2), pp.129–138, 1956.

[35] Frey, B. S., *Economics as a Science of Human Behaviour*, Boston: Kluwer Academic Publishers, 1992 (p.4).

[36] Hayek, F.A., *Law, Legislation, and Liberty: A New Statement of the Liberal Principles of Justice and Political Economy*, Vol. 1, Chicago: University of Chicago Press, 1973.

[37] North, D. C., "A Transaction Cost Theory of Politics", *Journal of Theoretical Politics*, 2(4), pp.355–367, 1990.

[38] Furubotn and Richter 2005, p. 314.

[39] Arrow, K. J., "The Organization of Economic Activity", *The Analysis and Evaluation of Public Expenditures: The PBB-System, Joint Economic Committee (91st Congress, 1st session, vol. 1)*, Washington: Government Printing Office, 59–73, 1969.

[40] Furubotn and Richter 2005, p. 51.

[41] Coase, R.H., "The Nature of the Firm", *Economica*, 4(16), pp.386–405, 1937.

[42] Fafchamps, M., "Spontaneous Markets, Networks, and Social Capital: Lessons from Africa", in Besley, T.; Jayaraman, R. (eds.) *Institutional Microeconomics of Development*, Cambridge: MIT Press, 44–88, 2010.

[43] Fafchamps 2010, pp.71-72.

[44] Furubotn and Richter 2005, pp. 258-265, 268-271.

[45] Bernstein, L., "Opting Out of the Legal System: Extralegal Contractual Relations in the Diamond Industry", *Journal of Legal Studies*, 21(1), pp.115–157, 1992.

[46] Landa, J. T., "A Theory of the Ethnically Homogeneous Middleman Group: An Institutional Alternative to Contract Law", *Journal of Legal Studies*, 10 (June), pp.349–362, 1981.

[47] Greif, A., "Contract Enforceability and Economic Institutions in Early Trade: The Maghribi Traders' Coalition", *American Economic Review*, 83(3), pp.525–548, 1993.

[48] Furubotn and Richter 2005, p.337.

[49] Williamson, O. E., "The Economics of Organization: The Transaction Cost Approach", American Journal of Sociology 87(3), pp.548–577, 1981.

[50] Olson, M., *The Rise and Decline of Nations: Economic Growth, Stagflation, and Social Rigidities*, New Haven, CT: Yale University Press, 1982.

[51] Egbert, H., "Business Success through Social Networks? A Comment on Social Networks and Business Success", *American Journal of Economics and Sociology*, 68(3), pp.665–677, 2009.

[52] Egbert, H., "Entrepreneurial Advantages and Disadvantages of Belonging", *GeoJournal* 46(2), pp.129–134, 1998.

[53] Biggs, T.; Raturi, M.; Srivastava, P., "Ethnic Networks and Access to Credit: Evidence from Manufacturing Sector in Kenya", *Journal of Economic Behavior and Organization*, 49(4), pp.473–486, 2002.

[54] Jackson, M. O., Wolinsky, A., "A Strategic Model of Social and Economic Networks", *Journal of Economic Theory*, 71(1), pp.44–74, 1996 (pp. 56-58).

[55] Schotter, A., *The Economic Theory of Social Institutions*, Cambridge: Cambridge University Press, 1981.

[56] Kosfeld, M., "Economic Networks in the Laboratory: A Survey", *Review of Network Economics*, 3(1):20–42, 2004.

[57] Kagel, J. H., Roth, A. E. (eds.), *The Handbook of Experimental Economics*, Princeton: Princeton University Press., 1995.

[58] Camerer, C. F., *Behavioral Game Theory*, Princeton: Princeton University Press, 2003.

[59] Friedman, D.; Cassar, A., *Economics Lab*, London: Routledge, 2004.

[60] Plott, C. R.; Smith, V. L. (eds.), *Handbook of Experimental Economics Results*, Volume 1, Amsterdam: North-Holland, 2008.

[61] Cassar, A., Friedman, D., Schneider, P. H., "A Laboratory Investigation of Networked Markets", *The Economic Journal* 120(547), pp.919–943, 2010.

[62] Bala, V., Goyal, S., "A Noncooperative Model of Network Formation", *Econometrica* 68(5), pp.1181–1229, 2000.

[63] Mantovani, M., Kirchsteiger, G., Mauleon, A., Vannetelbosch, V., *Myopic or Farsighted? An Experiment on Network Formation*, ECARES working paper 2011-004, Brussels: ECARES, 2011.

[64] Furubotn and Richter 2005, p. 351.

[65] Ostrom, E., "The Value-added of Laboratory Experiments for the Study of Institutions and Common-pool Resources", *Journal of Economic Behavior and Organization* 61(1):149-163, 2006.

[66] Furubotn and Richter 2005, c. 349.

[67] Olson, M., *The Logic of Collective Action: Public Goods and the Theory of Groups*, Cambridge, MA: Harvard University Press, 1965.

[68] Egbert, H., "Networking in Science and Policy Interventions: Comment", in M. Albert, D. Schmidtchen, S. Voigt (eds.) *Scientific Competition: Conferences on New Political Economy*, Vol. 25, Tuebingen: Mohr Siebeck, 231–234, 2008.